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CHANGES IN DELTAS NECESSITATE
REMEDIES FOR ARAL FISHING INDUSTRY:
CRITICIZES TAGANROG ENTERPRISES

Physical changes occurring in the structure of the Amn-Dar'ya and Syr-Dar'ya river deltas, channels, and tributary basins are among the factors influencing the fluctuation of fish reserves in the Aral Sea. These changes in turn radically change reproductive conditions, fattening, and wintering of carp, bream, sheatfish, pike, and other commercial fish, particularly certain forms of carp in the southern Aral Sea. During periods, when the Amn-Dar'ya delta is undergoing frequent flooding, reproduction, fattening, and wintering are better than during periods of river-bed stabilization. The bream, whose reproduction is concentrated in fresh-water currents near the river delta spawning grounds, is affected in the same way.

The character of the Amu-Dar'ya and Syr-Dar'ya deltas during the last 30 - 40 years has changed beyond recognition. Knowledge of these regularly occurring changes and their influence on the fishing industry should be used as the basis for preparing plans to improve the Aral Sea spawning basins. This task is becoming more pressing as the development of irrigation and dam construction in the basins of both rivers progresses.

It is characteristic for the Amu-Dar'ya and Syr-Dar'ya to have an exceptionally large number of silt and sand deposits and unstable (for the Amu-Dar'ya, also wandering) river channels. The flood peak in the Syr-Dar'ya is most frequently observed in June, while in the Amu-Dar'ya it is at the end of July and beginning of August. In both cases, flooding begins after the period of intensive spawning of bream and carp.

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The annual flow of these rivers, showing the predominance of the summer flow, is distributed as follows:

	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>	<u>Winter</u>
Amu-Dar'ya	19%	49%	22%	10%
Syr-Dar'ya	43%	44%	7%	6%

Water for these rivers comes from the following sources:

	<u>Underground</u>	<u>Snow</u>	<u>Rain</u>	<u>Glacier</u>
Amu-Dar'ya	20%	29%	--	51%
Syr-Dar'ya	13%	36%	--	51%

The Amu-Dar'ya and Syr-Dar'ya actually control the configuration of the region above the tributary basins' deltas by changes in their course and rate of flow.

At present, the total area of the Amu-Dar'ya delta equals 7,100 square kilometers. At the beginning of the 20th century, however, when the Kuvanysh-Dzharma and Yany-Sa streams were flowing, this area was approximately 14,900 square kilometers.

During the last decades, the following changes have occurred in the Amu-Dar'ya delta. After the bars along the shores had greatly increased in size, the main channels of the Amu-Dar'ya and Kipchak-Dar'ya were stabilized, and the majority of the small tributary streams dried up. This resulted in a sharp decrease of fresh river water inflow into the tributary basin deltas, which was a factor in hindering the water flow, and in the growing shallowness, swamping, and frequently, complete drying up of many lakes. This process is particularly important as it is the principal cause of the increasing saltiness and drying up of the spawning grounds located along the delta's outer fringe, where most of the commercially important fish of the Aral Sea breed.

Conditions in the Amu-Dar'ya basin reached their worst stage in 1945, when the tributary stream, the Raushan, was completely dammed up. It was reopened in 1947. However, the greatest change in the Amu-Dar'ya delta occurred, when Taldyk Bay was completely filled by Amu-Dar'ya deposits. In 1943, the configuration of the shore line of this bay changed from concave to convex. During the past 5 years, a tract of actively growing delta was being formed, stretching far into the sea, to the north of the formerly existing Taldyk Bay. From 1943 to 1947 the delta had grown in its central part to a distance of 8 kilometers, an average of 2 kilometers per year. Due to these changes the Amu-Dar'ya delta became less important in the fishing industry. The most important spawning grounds became salty and less effective in reproducing numerous bream, while the inner basins became less accessible for carp. In the spring of 1947 and 1948 the amount of salt in the Urginsk spawning grounds was 9 - 10 percent, in Kazakh-Dar'ya, 13 percent. This had a negative effect on the fishing industry not only in the delta, but the whole southern part of the Aral Sea.

On the basis of data collected in the delta by G. V. Nikol'skiy in 1935 - 1937, the exploration work of the Aral Scientific Station of the VNIRO (All-Union Scientific Research Institute of Marine Fish Economy and Oceanography) and the research work of the Aralrybrod conducted in 1946 - 1948, the area accessible to fish is estimated to have been approximately 2,700 square kilometers. At present, it has diminished to 700 square kilometers.

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The area of the Syr-Dar'ya delta is estimated at 175 square kilometers, which is approximately 40 times smaller than the area of the Amu-Dar'ya delta. Nevertheless, it plays an important role in the reproduction of fish reserves, as well as in commercial fishing in the northern half of the Aral Sea. Here also, however, the changes occurring during the past 30 years in many respects have made the Syr-Dar'ya less important for the fishing industry.

In the Syr-Dar'ya as in the Amu-Dar'ya the same process of embankment formation, river-channel stabilization, drying up of tributary streams, and a complete change of the general configuration of the delta, connected with its movement into the open sea, had been observed. By 1941, not a stream was left in the Syr-Dar'ya delta which could supply tributary basins with fresh water.

The growth of the delta along the main channel of the Syr-Dar'ya toward the sea, during the past 48 years, 1900 - 1948, equals 5.2 kilometers. This is an average of 108 meters a year.

Simultaneously with the reduction in water flow, weed growth and swamping of lakes and shallow adjoining delta bays are increasing.

The resultant increase in salt content of the Syr-Dar'ya delta water actually caused a drying out of the fish spawning grounds. In later years, remedial measures were undertaken, but due to the great increase in weed growth of the area, the grounds have not been completely restored to their former productivity either as spawning grounds or as fishing basins.

Based on a study of Amu-Dar'ya conditions and delta changes during the past century, it has been concluded that from time to time two types of conditions replace each other and form two types of deltas. The first is called "a stage of river-channel stabilization" and the second "a stage of flood predomination." The cycle character of these changes does not mean, however, that delta conditions recur in exact form. Each stage has its own characteristics due to evolutionary changes occurring in the main channel as well as in tributary basin deltas.

In short, changes in the Amu-Dar'ya delta can be described as follows: During stabilization periods water flows into the sea in one large current or a few muddy ones. The tributary basins at these stages are in a retarded state. The amount of water flow is insignificant and the basin area is decreased. During periods of flooding, the adjacent areas are supplied with river water which flows over banks and through a small number of side streams, most of which function only periodically. Water in the river delta rises slowly, but the growth of the advancing edge of the delta is exceptionally rapid.

During these periods conditions in delta basins for the reproduction and habitation of the semianadromous fish become worse due to their difficulty in passing into the inner parts of the flooded areas.

Annual deposits of silt and sand along the river banks and in the bottom of the channel gradually raise the river bed so that it controls the configuration of an area sometimes several meters large. As time passes, the delta structure changes, resulting in the formation of a new system of streams and flooding over adjacent depressed areas.

After this, the delta goes into the stage of flood predomination which also has its own characteristics. Most of the river water flows into the sea not through the main river channel, but by means of lakes and flooded areas. The advance of the delta is retarded and the alluvial fan grows higher. Large flooded areas become accessible to semi-anadromous fish.

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The spawning grounds bordering on part of the sea delta receive a sufficient supply of fresh water, producing a favorable habitat for most varieties of fish. As a result, the quantity and quality of fish in the basin is greatly increased and improved.

This process lasts until the new and growing river channel finds its way through the lakes and flooded areas to the sea. Then, the river-bed stabilization stage begins again, gradually drying out tributary streams and contracting the flooded area.

At present, the main channel of the Amu-Dar'ya delta is undergoing a typical stabilization stage.

Fish catches in the Aral Sea during the last 40 years have not shown stability. The maximum catch in the last 20 years, 1928 - 1947, was 177 percent of the minimum, and the maximum catch of carp was 353 percent of the minimum. The average catches from 1945 to 1947 were 74 percent of the catches from 1933 to 1947. Still greater decrease had been noted for carp catches. The current catches of carp average only 63 percent of the average catches during the past 15 years.

To a considerable degree Aral Sea fishing is based upon semianadromous fish which spawn in fresh water in delta spawning grounds. Therefore, in determining the size and uniformity of catches, it is most important to know the condition of the spawning grounds.

Remedial measures should be aimed at reestablishing the spawning grounds for semianadromous fish, and also creating in the alluvial fan and other spawning basins the most favorable conditions for service as spawning, fattening, and wintering grounds for salt- and fresh- water carp, bream, sheatfish, pike, pike-perch and other types of fish.

Among necessary conditions which must be created for spawning grounds are the following: (1) a sufficiently large supply of fresh water to guarantee change of water eight times a year; (2) creation of conditions favorable for the growth of vegetation which can serve as a substratum for fish spawn; (3) attempted control of the configuration of the area since this is important in facilitating the catching of fish; and (4) creation of free passages for migration of fish in both spawning grounds and basins for wintering.

Remedial measures should first provide for the restoration of sea bream and carp in the Amu-Dar'ya delta, and then for the inner basins of the delta and lakes of the Yrinsk and Karadznar lake systems.

As irrigation is developed, an unavoidable decrease of water in the Amu-Dar'ya is expected. This would prevent the normal change of water in the confines of the entire delta. To solve this problem, much of the water from the main channel should be directed westward in order to preserve a sufficiently large and stable fresh-water supply in basins forming in Adzhibaysk Bay after the water level drops from 3 to 4 meters.

Large-scale remedial measures in the Syr-Dar'ya delta are possible only if, after regulating water flow according to the fishing industry needs, the remaining flow will average yearly no less than 100 cubic meters a second, and if all water flow exceeding this amount be conserved. With a smaller supply of water, the preservation of bream for any length of time cannot be expected. Furthermore, with a lowering of the water level of more than one meter, the present Syr-Dar'ya spawning grounds could not produce, and bream reproduction in the northern part of the sea would be threatened with extinction.

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The primary work in the Syr-Dar'ya delta is the operation and upkeep of developed delta basins of the Kara-Chalan, Kara-Teren', and Dzhidinsk system of lakes, the diversion of part of the Syr-Dar'ya water through the Kostam-Karakul' system, and the construction on the Kamyshly-Bash group of lakes of installations which can control the water level in Kamyshly-Bash, Kayazdy, Lay-Kul', and Raim lakes.

Additional work in the Syr-Dar'ya delta should be done in consideration of the fact that at present the delta has moved to a point in the lake where no new spawning basins can be formed if the level of the water drops 2 - 3 meters. If such a drop should occur, it would be most effective to direct the greater part of the Syr-Dar'ya water northward through Kamyshly-Bash and Chumysh-Kul' lakes to Sary-Cheganak Bay. In this case there is a chance that during the next decades it may be possible to maintain a small, sufficiently stable fresh-water zone to have new spawning basins formed. Another possibility would be to direct the Syr-Dar'ya water flow into the Kuvan-Dar'ya. This measure would increase efficient spawning of bream and would allow the organization of a series of piscicultural farms covering a 1,500 - 2,000-hectare area along the Aksam-Kuvan-Dar'inskiy and Kostam-Karakul'skiy systems.

In discussing the expansion of the Aral Sea fishing industry, it should be remembered that in 15 - 20 years sea conditions will begin to change considerably due to regulation of water flow and curtailment of fresh water inflow into the sea. Along with the remedial measures described herein, the consequences of which will lead to a drop in sea level, in area and volume shrinkage of the sea, and to an increase in salt content, other measures to restore sea fauna by introducing more suitable species for the new surroundings will have to be taken.

On the other hand, the development of irrigation projects places before industrial fishing organizations the need to accelerate development methods for the artificial breeding of valuable migratory fish, such as small sturgeon and barbel.

Thus, rational organization of the Aral fishing industry demands, simultaneously, more intensified fishing, remedial measures, fish breeding, and acclimatization of new forms of fauna. At present, the most important of these are the remedial measures.

TAGANROG FISH PLANT BADLY ORGANIZED

The Fishing Kolkhoz imeni Voroshilov in Taganrogskiy Rayon, Rostov Oblast, completed its Five-Year Plan in 3½ years. According to V. V. Popov, chairman of the kolkhoz, two factors which played an important role in the attaining of record results were the correct selection of brigade leaders and fisherman for their jobs and the payment of commensurate wages. During the last 3 years, due to rigid discipline within the kolkhoz, there was not absenteeism and instead of the minimum 120 working days every kolkhoz member worked from 250 to 300 days.

The Taganrog Motorized Fishing Station and Taganrog Fish-Processing Plant, however, have been poorly organized in the handling of fish deliveries. Delivery of fish from the kolkhoz sometimes was inadmissibly delayed and thereby took the fishermen away from their work. In spite of numerous complaints by kolkhoz members, the Taganrog Fish-Processing Plant has not remedied the situation.

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